

# Chapter 15

## Smart Farming: Automatic Detection and Classification of Olive Leaf Diseases

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### ABSTRACT

*Olive trees diseases harm the quality and the quantity of the harvest seriously, which causes considerable economic losses for farmers, and more importantly affects the national economy in its entirety. The aim of this investigation is to work out a recognizing pattern method, based on the analysis of the texture and supervised classification. It essentially detects and classifies olive tree diseases in order to provide the farmers with tools helping them not only to get informed of their trees' diseases, but also to know how to treat them effectively.*

### INTRODUCTION

Presumably, agriculture is a perpetually significant and critical sector, which deeply motivates income-raising, poverty reduction and food security. However, the harvests depend essentially on the meteorological circumstances and the technical procedures. Agricultural scholars are able to intervene and act on the technicality of agriculture rather than on the weather unsettlement. In this respect, smart agriculture becomes more and more a necessity as it benefits from the technological and the scientific continuous

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progress. Specifically, artificial intelligence and pattern recognition are volatile. They are proven to be effective in medical, military, industrial fields, and notably agricultural. Smart farming (Walter, 2017) is a newly growing agricultural system of dealing with plants as living organisms.

In Tunisia, the cultivation of the olive tree is one of the vital sectors of the agricultural policy, covering 1.68 million hectares. It is equivalent to 30% of its agricultural land. Furthermore, it is financially a significant source of currency for the Tunisian state, being classified as the second largest exporter of olive oil just after the European Union (Jakson, 2015). In searching for the equation of guaranteeing a profitable harvest and quantity loss minimization, the farmers have a current recourse to the massive use of pesticides in an often preventive but not curative way; which is full of risk not only for human health but also for the environment and the biological balance of the existing microsystems in farms and forests. In this respect, a careful reduction of the use of chemicals is practical for considering both human health and natural balance, and notably for controlling the expenses of the purchase and the extensive uses of pesticides.

In this chapter, the authors come up with an intelligent agricultural application, based on pattern recognition and artificial intelligence techniques or more precisely, a machine learning, which offers the farmers an automatic detection and classification of leaf diseases in the olive tree, namely the olive tree moth, the peacock's eye and the sooty mold.

In the second section, a description of the investigated leaf diseases is given meticulously. The third section is about a range of pattern recognition techniques for leaf diseases existing in the literature. The developed approach is presented in section 4. Analyzes and interpretations of the findings are demonstrated and compared to others, which basically rely on different methods. The current project ends up with a conclusive section.

## BACKGROUND

### Olive Leaves Diseases

As it is commonly known olive leaves are vulnerable to numerous diseases. In this section, the authors give an idea of the most widespread diseases, mainly peacock eye disease, sooty mold and the olive tree moth, giving the causes of their cropping up and the means of how to deal with them.

The olive tree moth (Ghoneim, 2015), is a whitish butterfly. Once adult, it does not represent any danger because it no longer feeds. However, at the very beginning of its life, this insect is perilous. The eggs are laid in March on the underside of the leaves, giving rise to green caterpillars with yellow heads and feeding on the young leaves present mainly in trees less than four years old. Accordingly, the attacked leaves will have their ends curled up and cut as shown in Figure 1.

*Figure 1. Olive leaf attacked by olive tree moth caterpillars*



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